Chapter Objectives

Opening Essay Explain how human experiences breeding dog and food crops can provide insights into   
principles of genetics.

Mendel’s Laws

9.1 Describe pangenesis theory and the blending hypothesis. Explain why both ideas are now rejected.

9.2 Explain why Mendel’s decision to work with peas was a good choice. Define and distinguish between true-breeding organisms, hybrids, the P generation, the F1 generation, and the F2 generation.

9.3 Define and distinguish between the following pairs of terms: homozygous and heterozygous; dominant allele and recessive allele; genotype and phenotype. Also, define a monohybrid cross and a Punnett square.

9.3 Explain how Mendel’s law of segregation describes the inheritance of a single characteristic.

9.4 Describe the genetic relationships between homologous chromosomes.

9.5 Explain how Mendel’s law of independent assortment applies to a dihybrid cross. Illustrate this law with examples from Labrador retrievers and Mendel’s work with peas.

9.6 Explain how a testcross is performed to determine the genotype of an organism.

9.7 Explain how and when the rule of multiplication and the rule of addition can be used to determine the probability of an event. Explain why Mendel was wise to use large sample sizes in his studies.

9.8 Explain how family pedigrees can help determine the inheritance of many   
human traits.

9.9 Explain how recessive and dominant disorders are inherited. Provide examples of each.

9.10 Compare the health risks, advantages, and disadvantages of the following forms of fetal testing: amniocentesis, chorionic villus sampling, and ultrasound imaging. Describe the ethical dilemmas created by advances in biotechnology   
discussed in this chapter.

Variations on Mendel’s Laws

9.11–9.15 Describe the inheritance patterns of incomplete dominance, multiple alleles, codominance, pleiotropy, and polygenic inheritance. Provide an example of each.

9.13 Explain how the sickle-cell allele can be adaptive.

9.14–9.15 Explain why human skin coloration is not sufficiently explained by polygenic inheritance.

The Chromosomal Basis of Inheritance

9.16 Define the chromosome theory of inheritance. Explain the chromosomal basis of the laws of segregation and independent assortment.

9.17 Explain how linked genes are inherited differently from nonlinked genes.

9.18 Describe T. H. Morgan’s studies of crossing over in fruit flies. Explain how crossing over produces new combinations of alleles.

9.19 Explain how Sturtevant created linkage maps.

Sex Chromosomes and Sex-Linked Genes

9.20 Explain how sex is genetically determined in humans and the significance of the SRY gene. Compare the sex determination system in humans to those in fruit flies, grasshoppers, birds, and bees.

9.21–9.22 Describe patterns of sex-linked inheritance, noting examples in fruit flies and humans.

9.22 Explain why sex-linked disorders are expressed more frequently in men than in women.

9.23 Explain how the Y chromosome can be used to trace human ancestry.